Greenhope®

Bioplastic Living Lab

Clear proof of how Greenhope products actively return to the natural environment.

ecoplas®
Starch-based Biodegradable Bioplastics

NATURLOOP™
Plant-Based Home & Industrial Compostable Bioplastic

OXIUM®
Biodegradable Additive

Living Lab

Greenhope Bioplastic Living Lab is a Real-life representation of the effective biodegradation process of Greenhope products - Oxium, Ecoplas, and Naturloop – to effectively demonstrate the Return to Earth principles. "Return to Earth" is a process of returning plastic back to environment after used, in a form of eco-friendly and naturally decomposed.

Greenhope products are placed in terrariums which replicate to natural environments and monitored until the biodegradation process occurs. There are 3 terrariums using soil as the medium, and 1 aquarium using microalgae. Each terrarium is divided into 2 sections: conventional plastic and Ecoplas/Naturloop/Oxium.

ECOPLAS Biodegradation Process

Ecoplas is a cassava starch-based bioplastic that can be decomposed in soil within 7 months - 1 year. Starch molecules are grafted into plastic polymers to produce new compounds with biodegradation capabilities. When encountering soil or open environments, organisms (soil worms, soil insects, including microorganisms) can feed on and consume Ecoplas.

Conventional Plastic	ECOPLAS
	
Degrade in hundred years Damage soil condition Produce microplastic	Biodegrade in soil within 7 months – 1 year Does not damage soil condition Does not produce microplastic

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NATURLOOP Biodegradation Process

Naturloop is also a cassava starch-based bioplastic that can be decomposed by microbes and soil organisms (such as worms, soil insects, and others). However, Naturloop's decomposition process is faster, only taking 3-6 months. Naturloop can be composted both industrially and home, producing organic compost that can increase soil fertility.

Conventional Plastic	NATURLOOP
	
Degrade in hundred years Damage soil condition Produce microplastic	Decomposed in soil within 3-6 months Can be composted both industrially and home into natural compost Does not produce microplastic

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OXIUM Biodegradation Process

Oxium will degrade within 2-5 years through a 3-stage of degradation process, those are :

Stage 1: Abiotic Degradation

Triggered by exposure to sunlight, UV radiation, high temperature, and/or humidity, Oxium additives will accelerate the fragmentation of plastic into smaller sizes.

Stage 2: Biotic Degradation or Biodegradation

Oxium additives molecularly transform the weight of residual plastic to less than 5000 Daltons, so it can be consumed by microbes. With fragmentation into smaller sizes in the preceding stage, microbes can composted the plastic more easily and faster.

Stage 3: Return to Earth

In this stage, biodegradation process goes entirely, where the plastic will be fully decomposed by microbes into water (H_2O), carbon dioxide (CO_2), and biomass, so it will not produce microplastics.

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OXIUM Biodegradation Process with Microalgae

Microalgae act a crucial role as primary producers in aquatic ecosystems, as they occupy the lowest position in the food chain. Disruptions to microalgae life will impact the entire food chain. Independent and credible scientific research has found that plastics with Oxium additives, while still biodegradable in aquatic environments, also does not hinder microalgae growth due to a decrease in plastic molecular weight*. Conversely, conventional plastics inhibit microalgae growth and even damage water conditions, as evidenced by a brown color change in aquariums.

Source: Biodegradation of oxidized high-density polyethylene and oxo-degradable plastic using microalgae Dunaliella salina https://doi.org/10.1080/26395940.2022.2128884

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In the Living Lab, it has been proven that Greenhope products have successfully biodegraded naturally. Furthermore, the quality of Greenhope products has also been demonstrated through laboratory tests such as ASTM D6954, ASTM G21, ASTM D6866, ASTM D5988, ASTM D6400, AS 5810, ISO 14855, ISO 20200 and independent testing results.

RETURN to EARTH

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